

State of California  
The Resources Agency  
DEPARTMENT OF FISH AND GAME



STANDING STOCKS OF TROUT  
IN SECTIONS OF LITTLE LAST CHANCE CREEK  
PLUMAS COUNTY, 2004

by

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2005

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## INTRODUCTION

The Department of Water Resources (DWR) initiated an instream flow program in 1976 to identify streams that would benefit from flow enhancement and to assess instream values. This information could be used to justify additional flow releases as a means of increasing trout populations. The Northern District of the DWR selected Little Last Chance Creek below Frenchman Reservoir (Figure 1) as one of the streams to study under this program.

Department of Fish and Game (DFG) biologists studied trout populations in Little Last Chance Creek in late summer or early fall of 1976, 1981, 1986, 1988, and 1991 through 1997, 2000, and 2003. Brown trout (*Salmo trutta*) was the only game fish caught every year. Sacramento suckers (*Catostomus occidentalis*) were also caught (Brown 1976, Bumpass et al. 1989, Brown 1991, Brown 1992a, Brown 1992b, Brown 1993, Brown 1994, Brown 1995, Brown 1996, Brown 1997, Brown 1998, Brown 2001, and Brown 2004). This report documents the results of sampling conducted in 2004.

The purpose of the long-term study is to collect baseline data that may be used to evaluate the effects of the operation of Frenchman Reservoir on populations of trout in Little Last Chance Creek through the periodic sampling of fish at established stations in that creek. This data may also be used to measure the recovery of trout in Little Last Chance Creek following the rotenone treatment that the DFG conducted in June, 1991 to kill northern pike (*Esox lucius*) in Frenchman Reservoir.

## METHODS

Standing stocks of fishes were estimated at three stations in Little Last Chance Creek in Plumas County in October, 2004. Stations were intentionally selected to be near stations sampled in previous DFG studies and are described in Appendix 1. Markers had previously been placed in trees along the stream to identify station boundaries. Stations varied in length from 59.4 to 88.1 meters. The length and average width of each station was measured. Fish were captured with a Smith Root model LR-24 battery-powered backpack electroshocker in stream sections blocked by seines (Figure 2). Captured fish were removed from the net-enclosed section on each pass. Standing stock estimates of trout were developed using the two-count method of Seber and LeCren (1967) or the multiple-pass method of Leslie and Davis (1939) with limits of confidence computed using a formula proposed by DeLury (1951).

The weight of each trout was determined by displacement (Figure 3). Fork length (FL) of each trout was measured to the nearest millimeter. Scale samples were taken for trout as a means of estimating age.

The distribution of fish caught is listed according to location. Standing stocks of brown trout and rainbow trout (*Oncorhynchus mykiss*) were calculated by station.

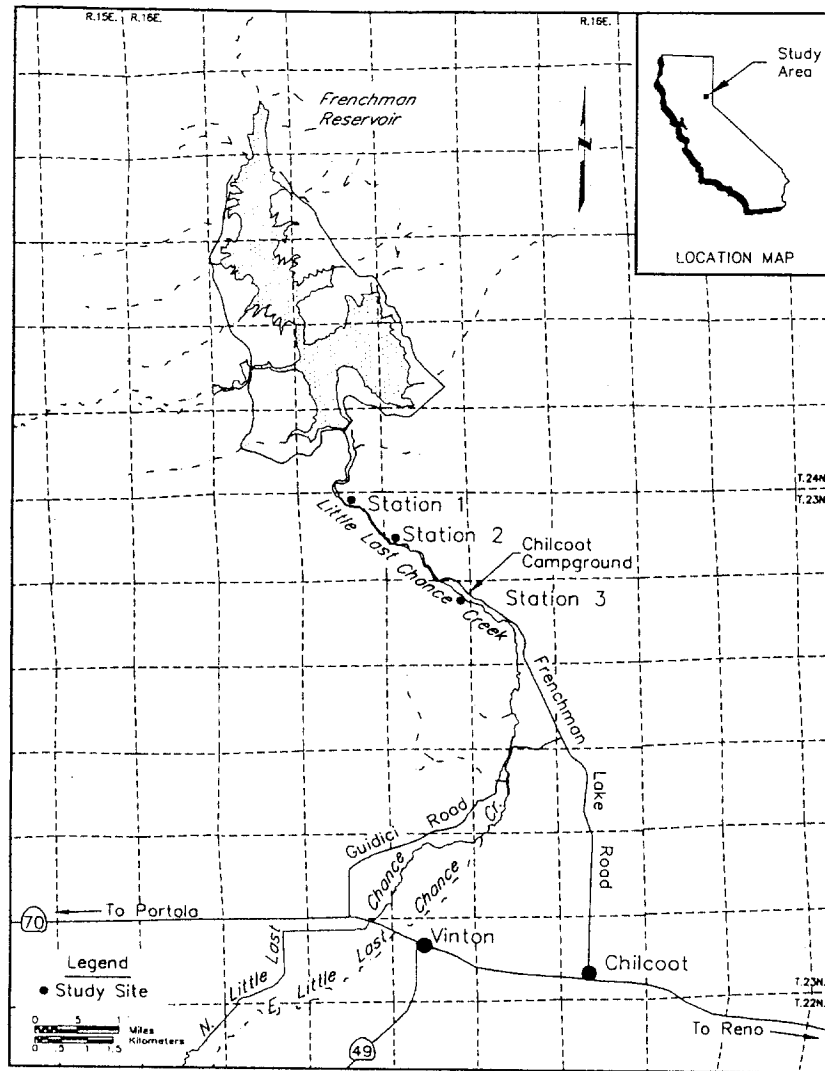


Figure 1. Map of sampling stations in Little Last Chance Creek, Plumas County, 2004.



Figure 2. Electrofishing



Figure 3. Weighing trout by displacement.

## RESULTS

Brown trout were caught at each station. Rainbow trout were only caught at station one. (Table 1).

Table 1. Fishes caught in selected sections of Little Last Chance Creek, Plumas County, 2004.

	Station Number		
	1	2	3
Distance below Frenchman Reservoir (km)	1.6	3.2	4.4
Brown trout	X	X	X
Rainbow trout	X		

Brown trout ranged in size from 80 to 484 mm FL (Figure 4). Brown trout biomass averaged  $21.3 \text{ g/m}^2$  at three stations. An estimated 206 brown trout large enough for anglers to catch and keep ( $>127 \text{ mm FL}$ ) were present in the stations that we sampled (Table 2).

Table 2. Estimate of brown trout standing crop in Little Last Chance Creek, Plumas County, 2004.

Distance below Frenchman Dam (km)	Population Estimate	95% Confidence Interval	Biomass ( $\text{g/m}^2$ )	Estimate of Catchable Trout ( $>127 \text{ mm FL}$ )	Biomass of Catchable Trout ( $\text{g/m}^2$ )
1.6	26	24-33	13.4	25	13.1
3.2	49	40-58	27.8	38	27.0
4.4	189	179-199	22.6	143	21.4

One rainbow trout was caught. It measured 208 mm FL. Rainbow trout biomass was  $0.3 \text{ g/m}^2$  at one station. One rainbow trout large enough for anglers to catch and keep ( $>127 \text{ mm FL}$ ) was present in the stations we sampled (Table 3).

Table 3. Estimate of rainbow trout standing crop in Little Last Chance Creek, Plumas County, 2004.

Distance below Frenchman Dam (km)	Population Estimate	95% Confidence Interval	Biomass (g/m <sup>2</sup> )	Estimate of Catchable Trout (>127 mm FL)	Biomass of Catchable Trout (g/m <sup>2</sup> )
1.6	1	1-1	0.3	1	0.3

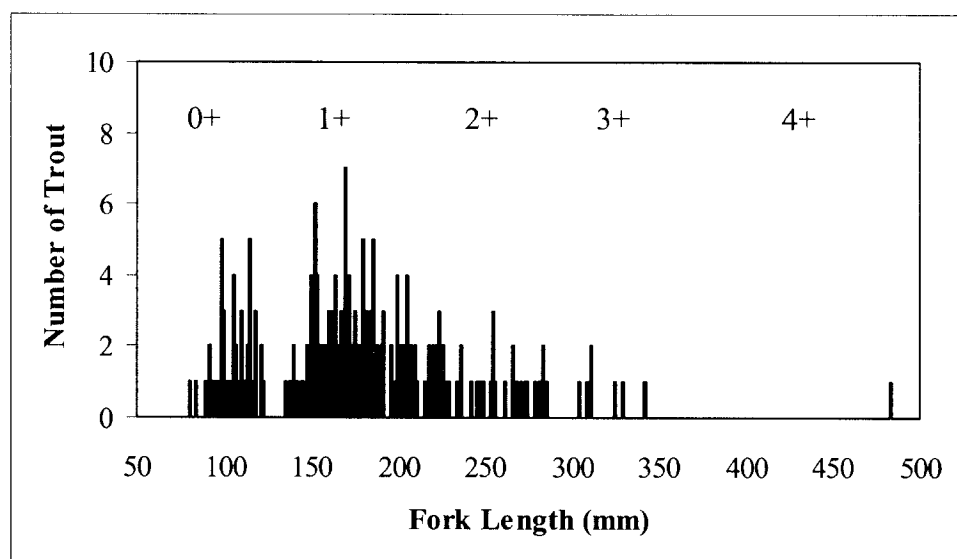


Figure 4. Length, observed frequency, and age of brown trout caught in Little Last Chance Creek, Plumas County, 2004.

The relationship between fork length (FL) and weight (W) of brown trout is:

$$\text{Log}_{10} W = -5.0 + 3.0 \text{ Log}_{10} \text{ FL}$$

$$r^2 = 0.99$$

N = 244 (Figure 5 and Appendix 2)

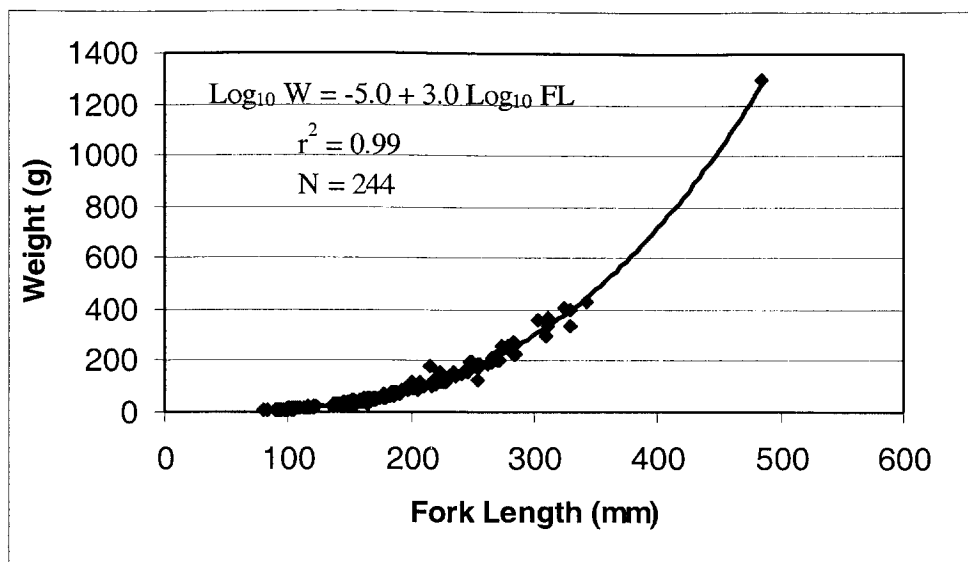


Figure 5. The relationship between length and weight of brown trout caught in sections of Little Last Chance Creek, Plumas County, 2004.

#### Age and Growth

Trout length and age are related. One way of measuring this is a correlation between trout lengths and the size of their scales. The formula  $FL = -0.4 + 0.9 S$  describes the relationship between the fork length and enlarged scale radius (S) of 153 brown trout caught in Little Last Chance Creek. The coefficient of correlation ( $r^2$ ) is relatively high value of 0.87.

Population growth and mean individual growth was only determined for brown trout (Table 4).

Table 4. Growth rates for brown trout caught in Little Last Chance Creek, 2004.

Age	Length Interval (mm)	Difference of Natural Logarithms	Population Instantaneous Growth Rate ( $G_x$ )	Length Interval (mm)	Difference of Natural Logarithms	Individual Instantaneous Growth Rate (G)
1-2	114-188	0.5002	1.5007	108-188	0.5543	1.6629

Age 1+ and age 2+ brown trout averaged 158 mm and 221 mm FL, respectively. Age 3+ brown trout averaged 320 mm FL. One age 4+ brown trout measured 484 mm FL (Table 5). One age 1+ rainbow trout measured 208 mm. Length and weight of individual fishes caught are compiled in appendices 2 and 3.



Table 5. Calculated average fork length of brown trout from Little Last Chance Creek, 2004.

Age	Number of Fish	Length at Capture	Length at Successive Annulus	
			1	2
1	80	158	114	
2	73	221	108	188
Number of Back Calculations			153	73
Weighted Means (mm)			111	188
Increments (mm)				77

#### Coefficient of Condition

The coefficient of condition is generally used by fisheries biologists to describe the relative “robustness” or plumpness of a fish (Lagler 1956). The average coefficient of condition for 244 brown trout was 1.1032 (Table 6) and 1.1363 for 1 rainbow trout (Table 7). The rainbow trout had slightly higher coefficient of condition than the brown trout.

Table 6. Condition of brown trout in Little Last Chance Creek, Plumas County, 2004.

Age	Number of Fish	Coefficient of Condition	95% Confidence Interval
Brown Trout			
0+	46	1.0933	0.7860-1.4005
1+	98	1.0827	0.5725-1.5929
2+	91	1.1280	0.9204-1.3357
3+	8	1.1224	0.9134-1.3314
4+	1	1.1466	
Combined	244	1.1032	0.7900-1.4164

Table 7. Condition of rainbow trout in Little Last Chance Creek, Plumas County, 2004.

Age	Number of Fish	Coefficient of Condition	95% Confidence Interval
Rainbow Trout			
1+	1	1.1363	

## DISCUSSION

Population trends of rainbow and brown trout have been increasing as a result of trout that the DFG planted (Table 8). Rainbow trout populations generally increased from 1996 through 1997 because Frenchman Reservoir periodically spills in the winter and spring. Rainbow trout populations averaged 52 during that period. Rainbow trout migrate downstream over the spillway into Little Last Chance Creek during spills. Few brown trout migrate during spills. Brown trout population estimates before the 1991 rotenone treatment averaged 9 trout while after treatment averaged 32 trout. Biomass averaged 2.9 g/m<sup>2</sup> before treatment and 13.2 g/m<sup>2</sup> after treatment. Rainbow trout population estimates averaged 42 trout before treatment and 13 trout after. Biomass averaged 3.7 g/m<sup>2</sup> before treatment and 2.2 g/m<sup>2</sup> after (Table 9).

Relatively large numbers of brown trout were caught in 2004. There was good survival of each year class. Good growth rates, condition factors, and survival are usually a result of favorable environmental conditions such as stream flow or water temperature (Brown 1993a). Few rainbow trout in the catch this year could be a result of predation of their young by the large population of brown trout.

Table 8. Records of trout planting in Little Last Chance Creek following initial treatment with rotenone in June 1991.

Year	Rainbow Trout		Brown Trout	
	Catchable	Fingerling	Catchable	Fingerling
1991	500	0	1,300	0
1992	1,000	0	0	0
1993	1,540	0	0	3,000
1994	0	0	0	5,240
1995	0	0	1,250	0
1996	0	0	0	3,000
1997	0	1,500	0	1,631

Some of the trout we caught in recent years were planted by the DFG. The DFG planted trout in the summer of 1991 and spring and summer of 1992 through 1997. The DFG planted catchable rainbow trout in 1991, 1992, and 1993. Catchable brown trout were planted in 1991 and 1995. Twenty brown trout broodstock were also planted in 1991. Fingerling brown trout were planted in 1993, 1994, 1996, and 1997. Fingerling rainbow trout were planted in 1997 (Table 8) (Ron DeCoto, Fishery Biologist, DFG, personal communication). No trout were planted this year.

Brown trout populations have largely recovered in Little Last Chance Creek from the treatment of rotenone that was used to kill northern pike in June, 1991. The DFG killed northern pike in this watershed to prevent them from migrating downstream into the Sacramento River and Sacramento-San Joaquin Delta. The DFG and others believe that pike could become established in the Sacramento River and become significant predators on juvenile salmonids (Brown 1992a).

Thirty large brown trout (254-484 mm FL) were caught that were nearly ripe. They spawn in October or November. Spawning sized gravel is concentrated above station 1 which is where most trout spawn (Figure 1). While spawning was successful last year, most age 0+ brown trout were found in station 3.

Table 9. Average standing crop and biomass for brown and rainbow trout in Little Last Chance Creek, 1976-2004.

Year	Brown trout		Rainbow trout	
	Population estimate	Biomass (g/m <sup>2</sup> )	Population estimate	Biomass (g/m <sup>2</sup> )
1976	1	0.5	10	3.6
1981	6	2.7	17	4
1986	10	3.7	96	3.6
1988	20	4.7	43	3.7
Average	9	2.9	42	3.7
1991	1	0.2	0	0
1992	4	0.1	1	0.1
1993	11	1.1	0	0
1994	27	10.6	0	0
1995	34	26.2	1	0.1
1996	41	14.9	41	3.6
1997	27	12.3	63	12.7
2000	12	6.5	20	4.9
2003	85	38.8	1	0.6
2004	87	21.3	1	0.1
Average	42	13.2	13	2.2

While our periodic sampling of trout in Little Last Chance Creek has allowed us to observe the prolonged effects of rotenone on trout populations and their recovery, the main purpose of our study has not changed. Our purpose is to collect baseline data to evaluate the effects of the operation of Frenchman Reservoir on trout populations in Little Last Chance Creek.

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## APPENDIX 1

### PERMANENT FISH POPULATION STATIONS FOR LITTLE LAST CHANCE CREEK, PLUMAS COUNTY OCTOBER, 2004.

Station 1 - Located 1.6 km below Frenchman Dam just downstream from the first bridge at elevation of 1659 m MSL in NW 1/4 of NE 1/4, Section 4, T23N, R16E. This station begins in a riffle beneath the bridge of Frenchman Lake Road, then enters a pool with a deeply undercut room-sized boulder on the right bank. The remainder of the station is a short riffle and a shallow pool/run. About 55 percent of the station is pool and 45 percent riffle. Substrate is boulder, rubble, and sand. The station is 61 m long with a surface area of 308.8 m<sup>2</sup> at a flow of 0.4 cms.

Station 2 - Located 3.2 km below Frenchman Dam adjacent to the upper end of a large turnout at an elevation of 1610 m MSL in NW 1/4 of SW 1/4, Section 3, T23N, R16E. This station begins in a large plunge pool followed by two shallow pool/run areas and two short riffles. About 45 percent of the station is pool and 55 percent riffle. Substrate is boulder, rubble, and sand. The station is 59.4 m long with a surface area of 297.7 m<sup>2</sup> at a flow of 0.4 cms.

Station 3 - Located 4.4 km below Frenchman Dam adjacent to the cutoff road in the center of Chilcoot Campground at an elevation of 1561 m MSL in NE 1/4 of NE 1/4, Section 10, T23N, R16E. This station begins in a steep riffle followed by a long pool with undercut right bank, then a short riffle, a short pool, and finally, another steep riffle. The station is 40 percent pool and 60 percent riffle. Substrate is boulders, rubble, and sand. The station is 88.1 m long with a surface area of 477.4 m<sup>2</sup> at a flow of 0.4 cms.

## Appendix 2

### Length and Weight of Brown Trout Caught in Little Last Chance Creek, 2004

Length (mm)	Weight (g)	Length (mm)	Weight (g)	Length (mm)	Weight (g)	Length (mm)	Weight (g)
80	5	110	13	148	35	163	46
83	11	110	14	150	34	164	46
89	7	112	16	150	36	164	44
90	7	113	17	150	36	164	41
91	9	113	17	150	36	164	28
91	9	114	19	151	38	165	52
92	8	114	16	151	38	165	48
93	7	114	16	152	37	166	47
95	9	114	15	152	34	166	55
96	10	115	20	152	34	167	48
97	9	115	14	152	48	167	48
98	8	115	16	152	40	167	48
98	11	115	16	152	39	170	51
98	11	115	15	154	34	170	56
98	10	117	18	154	47	170	56
98	11	118	19	154	47	170	50
99	12	118	15	154	40	170	50
100	11	118	19	155	34	170	55
100	11	121	22	155	34	170	54
100	11	121	19	157	37	171	56
101	12	122	20	157	40	171	50
102	12	135	25	158	47	171	52
103	11	137	28	158	42	172	56
105	11	138	25	159	38	172	58
105	12	139	28	159	38	172	44
105	11	140	28	160	41	172	44
105	12	140	30	160	50	174	54
106	12	142	30	160	39	174	54
106	13	144	34	161	42	175	55
108	14	145	38	162	56	175	58
109	14	146	34	162	46	175	58
110	14	148	36	162	50	176	64

## Appendix 2

### Length and Weight of Brown Trout Caught in Little Last Chance Creek, 2004 (Continued)

Length (mm)	Weight (g)	Length (mm)	Weight (g)	Length (mm)	Weight (g)	Length (mm)	Weight (g)
177	56	196	90	221	127	271	200
178	67	197	94	222	124	273	200
178	52	198	83	222	124	274	255
180	62	200	93	223	120	279	260
180	65	200	92	224	114	281	245
180	62	200	90	224	155	282	240
180	62	200	90	224	135	283	275
180	57	201	120	225	114	284	260
181	64	202	97	225	142	284	230
181	62	202	97	226	137	285	230
182	62	203	92	226	120	286	265
182	62	203	95	227	130	304	360
182	62	204	97	228	116	309	300
185	70	205	87	229	115	311	365
185	77	205	93	234	155	311	340
185	78	205	98	236	138	325	410
186	75	205	98	236	150	329	340
186	66	207	115	242	150	330	400
186	73	208	101	246	175	342	430
186	66	208	100	247	160	484	650
186	73	209	105	248	195		
187	75	210	100	249	195		
188	78	210	100	254	190		
188	68	211	104	255	185		
190	80	216	180	255	172		
190	80	217	105	255	125		
191	77	218	121	256	190		
191	73	218	127	262	185		
191	68	219	110	266	210		
192	82	220	124	266	198		
192	87	220	107	267	200		
196	95	221	127	269	220		



## Appendix 3

### Length and Weight of Rainbow Trout Caught in Little Last Chance Creek, 2004

Length (mm)	Weight (g)
208	101